

PATENT  
Atty. Dkt. No. AMAT/5297/DSM/LOW K/JW

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MAY 24 2004

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of:  
Rivoire, et al

Serial No.: 09/844,991

Filed: April 27, 2001

For: Method for Planarizing Organosilicate Layers

te 200

Group Art Unit: 3723

Examiner: Robert A. Rose

Confirmation No.: 1361

MAIL STOP AF  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

**DECLARATION UNDER 37 C.F.R. § 1.131**

I, the undersigned attorney of record, Keith M. Tackett, hereby declare as follows:

1. Attached is an invention alert (Exhibit A) dated prior to August 24, 2000, that my firm received prior to filing the present application. All masked dates in Exhibit A are prior to August 24, 2000. Confidential information not relevant to the invention date of the present application is also masked.
2. In view of Exhibit A, the invention of pending claims 8, 10, 11, 14-19, 21, 25-30, and 35-36 was conceived prior to August 24, 2000, and filed with due diligence from prior to August 24, 2000, to filing of the present application on April 27, 2001.
3. The undersigned, Keith M. Tackett, hereby declares that all statements made herein of his own knowledge are true and that these statements made on information and belief are believed to be true and further that these statements were made with knowledge that willful false statements and the like so made are

**CERTIFICATE OF FACSIMILE  
TRANSMISSION UNDER 37 CFR 1.8**

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punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent resulting therefrom.

5/24/04

Date

Keith M. Tackett

Keith M. Tackett

275571\_1

INVENTION ALERT FORM

COMPUTER ENTERED

J005257

TO: Gaile Bailey  
Extension: 32724M/S 2061  
32724

ALERT NO: \_\_\_\_\_

Date

Current Date: \_\_\_\_\_

Date

CIRCLE ONLY ONE FROM EACH TOP SECTION:

1) OWNER 2) DIVISION 3) FINANCIAL COST CENTERS(PGB)

PLEASE SUBMIT ONE ORIGINAL, SIGNED DOCUMENT FOR RECORDING. IF THIS IS A COPY  
OF A PREVIOUSLY SUBMITTED ALERT, PLEASE MARK IT ACCORDINGLY

| OWNER:     | AMAT      | AMT            | AMSEA            | AMK        | AMJ                 | AKT      |
|------------|-----------|----------------|------------------|------------|---------------------|----------|
| ATT 0723   | KPU1 0166 | METAL 0881     | IBSS 0676        | CORE 0793  | COPPER 2492         | OPAL     |
| ORION 2471 | KPU3 0281 | SILICON 0916   | SMO GASFLOW 1659 | AID 1301   | PLUG 2492           | ORBOT    |
| CAP 2512   | KPU8 0195 | IPS *0521      | SMO PUMPS 1651   | GREEN 2590 | LINER/ BARRIER 2492 | APD 2613 |
| SWIFT 1755 | PSI 2442  | COM ENG 1419   | WMO/Austin 2081  |            | ECD/CU 2492         | ICT      |
| EPI 2470   | CMP 1399  | SMO 1659       | PRP 1654         |            | COMMON 2492         |          |
| TPO* 0584  | LOWK 2445 | CORE TECH 1245 | 300mm 2199       |            | IMS 2492            |          |
|            |           |                |                  |            | BASELINE 2492       |          |

\*TPO - RTP/HTF/OXDL

\*\*IPS - MXP/RPS/HDP

Please use separate attachments for any answers that don't fit on the form, especially for questions 3-8. If the answer to a question is "NONE", please write "NONE" rather than leaving the answer blank.

1. Title of Invention (please print clearly):

Novel CMP Polishing Techniques for S-O-C films

2. Inventors-Names only-(please print clearly and provide complete information at Section 9)

Maurice Riviere - ST employee

Frederic Gaillard - AMAT employee

Charles Lutti - ST employee

Ellie Yieh - AMAT employee

3. Earliest dates and model names of all Applied products incorporating the invention which have been offered for sale or are expected to be offered for sale:

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4. If the invention has been demonstrated or described to persons other than Applied employees, for each disclosure please provide the earliest date, name of company, a brief description of what was disclosed and the purpose of the disclosure. Attach a copy of any related non-disclosure agreements:

*Confidential*

5. If future disclosures like those in Question #4 are expected to occur within the next 12 months, please provide the anticipated date, type of information to be disclosed, and purpose of the disclosure: NONE [ ]

*None at this time ST*

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6. Describe any other known designs or processes, whether actually implemented or merely proposed in a publication, which could be considered similar to your invention or which constitute the state-of-the-art improved upon by your invention: If described in a publication, attach a copy of same or provide a citation.

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7. List each feature of the invention which you consider novel and non-obvious. Describe the advantages of each novel feature in comparison with the state-of-the-art approaches which are most similar to your invention:

See attached

8. Describe the invention, preferably with reference to attached drawings:

See attached

ATTACH ADDITIONAL SHEETS TO DESCRIBE INVENTION AS NEEDED

9. Provide the following information for EACH inventor:

**Inventor #1:**Legal Name: RIVOIRE Janice Employee # \_\_\_\_\_ Mail Stop \_\_\_\_\_

Work Phone

Job Title: \_\_\_\_\_

Citizenship: \_\_\_\_\_

Home Address: \_\_\_\_\_

Manager: \_\_\_\_\_

Div. Manager: \_\_\_\_\_

Product Group: \_\_\_\_\_

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**Inventor #2:**Legal Name: GAILLARD Fredric Employee # \_\_\_\_\_

Work Phone

Job Title: \_\_\_\_\_

Citizenship: \_\_\_\_\_

Home Address: \_\_\_\_\_

Manager: \_\_\_\_\_

Div. Manager: \_\_\_\_\_

Product Group: \_\_\_\_\_

Confidential

**Inventor #3:**Legal Name: LUTTI Charles Employee # \_\_\_\_\_ Mail Stop \_\_\_\_\_

Work Phone

Job Title: \_\_\_\_\_

Citizenship: \_\_\_\_\_

Home Address: \_\_\_\_\_

Manager: \_\_\_\_\_

Div. Manager: \_\_\_\_\_

Product Group: \_\_\_\_\_

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FOR ADDITIONAL INVENTORS, PLEASE COMPLETE AND ATTACH ADDITIONAL SHEET AS NEEDED.

**ADDITIONAL INVENTORS:**

|                    |                     |                    |              |
|--------------------|---------------------|--------------------|--------------|
| <b>Inventor #:</b> | <u>Y1F#1</u>        | <b>Employee #:</b> | <u>Ellis</u> |
| Legal Name:        |                     |                    |              |
| Work Phone         |                     |                    |              |
| Job Title:         |                     |                    |              |
| Citizenship        | <i>Confidential</i> |                    |              |
| Home Address       |                     |                    |              |
| Manager:           |                     |                    |              |
| Div. Manager       |                     |                    |              |
| Product Group:     |                     |                    |              |

|                    |                    |                  |
|--------------------|--------------------|------------------|
| <b>Inventor #:</b> | <b>Employee #:</b> | <b>Mail Stop</b> |
| Legal Name:        |                    |                  |
| Work Phone         | Fax No.:           |                  |
| Job Title:         |                    |                  |
| Citizenship:       |                    |                  |
| Home Address       |                    |                  |
| Manager:           | Title:             |                  |
| Div. Manager       | Title:             |                  |
| Product Group:     | Dept #:            |                  |

|                 |                   |                  |
|-----------------|-------------------|------------------|
| <b>Inventor</b> | <b>Employee #</b> | <b>Mail Stop</b> |
| Legal Name:     |                   |                  |
| Work Phone      | Fax No.:          |                  |
| Job Title:      |                   |                  |
| Citizenship:    |                   |                  |
| Home Address:   |                   |                  |
| Manager         | Title:            |                  |
| Div. Manager    | Title:            |                  |
| Product Group:  | Dept #:           |                  |

10. Signature, date and PRINTED name of each inventor plus two witnesses who have read and understood this Invention Alert form:

**Inventors:**

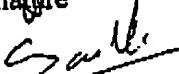
Mannie Rivine  
Printed Name

Date  
Date

  
Signature

Fredine Gaillard  
Printed Name

Date  
Date

  
Signature

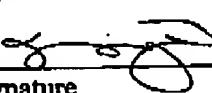
Shank Lutti  
Printed Name

Date  
Date

  
Signature

Ellie Yieh  
Printed Name

Date  
Date

  
Signature

Printed Name

Date

Signature

Printed Name

Date

Signature

**Witness:**

Printed Name

Date

Signature

Printed Name

Date

Signature

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# POLISHING PART FOR THE SiOC PATENT

## I. SiOC POLISHING INTRODUCTION:

With slurries currently used to polish silicon, silicon-oxide or silicon-nitride, the polishing removal rate of SiOC layer is low (<1000 Å/mn). A polishing at lower removal rate on SiOC material induces a lot of defects in this material, like scratches or cracks. The pressure could be reduced to decrease the polishing defects, but the removal rate is also strongly decreasing. Here under, the inventors demonstrate by experiments that the slurry must have the following characteristics to obtain a high polishing removal rate and lower defects : high silica particles size (>35nM) and concentration ( $\geq 22\%$ ), and a high pH ( $\geq 10$ ) with buffer like ammonia or potassium for instance.

## II. POLISHING CONDITIONS

(Chemical Mechanical Polishing = CMP)

### CMP process window

Pressure : 1 to 14 psi  
 Platen speed : 0,1 to 2 m/s  
 Pad : any  
 Slurry : any colloidal silica particles dispersed in water or other solution with characteristics described in the following reclaims  
 Polisher : any type

### CMP preferred conditions

Pressure : 4 psi  
 Platen speed : 0,8 m/s  
 Pad : polyurethane Rodel IC 1400  
 Slurry : Klebosol slurry (Clariant) : colloidal silica particles dispersed in water with characteristics described in the following reclaims  
 Polisher : Mirra of Applied Materials

## III. EXPERIMENTS

Polishing removal rate (Å/mn) results on SiOC as function of slurry characteristics, polished at the preferred conditions.

a) Removal rate as function of slurry pH (buffered by NH4OH) and silica particles size, for silica concentration =30% by weight in the slurry solution :

| Particles size | PH 2,5   | pH 10    | pH 11     |
|----------------|----------|----------|-----------|
| 20 nM          | 100 Å/mn | -        | -         |
| 35 nM          | -        | 410 Å/mn | 600 Å/mn  |
| 70 nM          | 400 Å/mn | 950 Å/mn | 3080 Å/mn |

b) Removal rate for silica concentration =22% by weight in the slurry solution, at pH =11 (buffered by NH4OH) and at particle size =70nM :

=> Removal Rate =2100 Å/mn.

c) Removal rate for slurry pH =11 buffered by KOH, at particle size =70nM and at silica concentration =30% by weight in the slurry solution :

=> Removal Rate =3300 Å/mn

**IV. RECLAIMS ON SLURRY CHARACTERISTICS**

The inventors reclaim that for polish the SiOC materials, the higher removal rate is obtained by a silica slurry solution with the following characteristics :

- 1) High pH  $\geq 10$  (a)
- 2) High silica particles size  $\geq 35$  nM (a)
- 3) High silica particles concentration (a and b)
- 4) Ammonia (NH4OH) or potassium (KOH) elements could be used as pH buffering (a and c).

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May-24-04 03:19pm From-Moser, Patterson & Sheridan L.L.P.

+713 623 4846

T-639 P.020/020 F-645

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